

**METHOD, APPARATUS, SYSTEM AND  
COMPUTER PROGRAM PRODUCT FOR  
COORDINATION OF WIRELESS  
TRANSMISSION IN A FREQUENCY BAND**

**BACKGROUND**

**[0001]** 1. Field

**[0002]** Embodiments of the invention relate to wireless transmission technology deployment in frequency bands, such as, but not limited to, for example, methods of coordinating Long Term Evolution (LTE) evolved Node Bs (eNBs) to allow them to transmit using a same time-frequency resource.

**[0003]** 2. Description of the Related Art

**[0004]** LTE is a standard for wireless communication that seeks to provide improved speed and capacity for wireless communications by using new modulation/signal processing techniques. The standard was proposed by the 3<sup>rd</sup> Generation Partnership Project (3GPP), and is based upon previous network technologies. Since its inception, LTE has seen extensive deployment in a wide variety of contexts involving the communication of data.

**SUMMARY**

**[0005]** According to a first embodiment, a method may comprise receiving channel-state information of at least one channel in a frequency band from at least a subset of a plurality of transmission nodes. The method may also comprise coordinating reserving of the at least one channel for a set of transmission nodes within the plurality of transmission nodes. The coordinating may be based on the received channel-state information to allow simultaneous transmission on the at least one channel by the set of transmission nodes. The method may also comprise communicating reservation information for the at least one channel to the set of transmission nodes.

**[0006]** In the method of the first embodiment, the method may further comprise determining the set of transmission nodes for temporarily reserving the at least one channel. The set may be determined based on the received channel-state information.

**[0007]** In the method of the first embodiment, the method may be performed by a controller.

**[0008]** In the method of the first embodiment, the plurality of transmission nodes may comprise a plurality of long-term evolution nodes.

**[0009]** In the method of the first embodiment, the set of transmission nodes may be isolated from other transmission nodes of the plurality of transmission nodes.

**[0010]** In the method of the first embodiment, the frequency band may be an unlicensed band.

**[0011]** In the method of the first embodiment, the transmission nodes of the plurality of transmission nodes may be geographically clustered.

**[0012]** In the method of the first embodiment, the reservation information may comprise at least one of a start time and a length of time for reserving of the channel.

**[0013]** In the method of the first embodiment, the method may further comprise polling the channel-state information of the at least one channel from the subset of the plurality of transmission nodes.

**[0014]** According to a second embodiment, an apparatus may comprise receiving means for receiving channel-state

information of at least one channel in a frequency band from at least a subset of a plurality of transmission nodes. The apparatus may also comprise coordinating means for coordinating reserving of the at least one channel for a set of transmission nodes within the plurality of transmission nodes. The coordinating may be based on the received channel-state information to allow simultaneous transmission on the at least one channel by the set of transmission nodes. The apparatus may also comprise communicating means for communicating reservation information for the at least one channel to the set of transmission nodes.

**[0015]** In the apparatus of the second embodiment, the apparatus may further comprise determining means for determining the set of transmission nodes for temporarily reserving the at least one channel. The set may be determined based on the received channel-state information.

**[0016]** In the apparatus of the second embodiment, the apparatus may be a controller.

**[0017]** In the apparatus of the second embodiment, the plurality of transmission nodes may comprise a plurality of long-term evolution nodes.

**[0018]** In the apparatus of the second embodiment, the set of transmitting nodes may be isolated from other transmitting nodes of the plurality of transmitting nodes.

**[0019]** In the apparatus of the second embodiment, the frequency band may be an unlicensed band.

**[0020]** In the apparatus of the second embodiment, the transmission nodes of the plurality of transmission nodes may be geographically clustered.

**[0021]** In the apparatus of the second embodiment, the reservation information may comprise at least one of a start time and a length of time for reserving of the channel.

**[0022]** In the apparatus of the second embodiment, the apparatus may further comprise polling means for polling the channel-state information of the at least one channel from the subset of the plurality of transmission nodes.

**[0023]** According to a third embodiment, a method may comprise receiving, by a transmission node, reservation information for at least one channel in a frequency band from a second node. The method may also comprise determining, by the transmission node, a temporary time for reserving the at least one channel based on the received reservation information. The method may also comprise reserving the at least one channel for the determined temporary time.

**[0024]** In the method of the third embodiment, the method may further comprise detecting, by the transmission node, channel-state information of the at least one channel, and providing, by the transmission node, the detected channel-state information to the second node.

**[0025]** In the method of the third embodiment, the method may further comprise determining, by the transmission node, whether other transmission nodes have started transmitting via the at least one channel. If other transmission nodes have started transmitting, the temporary time may be affected by the transmissions of the other transmission nodes.

**[0026]** In the method of the third embodiment, the method may further comprise determining, by the transmission node, whether the at least one channel is free from non-long-term evolution communication. The transmission node may comprise a long-term evolution transmission node.

**[0027]** In the method of the third embodiment, the method may further comprise issuing, by the transmission node, a request-to-send/clear-to-send reservation command for reserving the at least one channel.